TITLE

FOLDING KNIFE LIGHT TOOL

CLAIM OF PRIORITY

[0001] This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from my provisional application *SINGLE BODY MULTI-TOOL DEVICE* filed with the U.S. Patent & Trademark Office on the 3rd of March 2003 and there duly assigned Serial No. 60/451,544.

BACKGROUND OF THE INVENTION

Technical Field

[0002] The present invention relates generally to folding knives and processes for manufacturing knives, and more specifically to a folding knife incorporating a source of selectively operable illumination.

Related Art

[0003] Many different types of folding knives are available. Exemplary knives provided with lighting fixtures may be found in such references as U.S. Patent No. 4,364,104 to Holahan *et al.*, entitled *NOVELTY LIGHT*, issued on December 14, 1982; U.S. Patent No. 5,313,376 to McIntosh, entitled *MULTIPURPOSE KNIFE/LIGHT*, issued on May 17, 1994; U.S. Patent No. 5,467,256 to Chen, entitled *KNIFE WITH LIGHTING FIXTURE*, issued on November 14, 1995; U.S. Patent

No. 5,727,319 to Myerchin *et al.*, entitled *KNIFE WITH ILLUMINATED BLADE*, issued on March 17, 1998; U.S. Patent No. 4,751,621 to Jenkins, entitled *LIGHT KNIFE,* issued on June 14, 1988; U.S. Patent No. 6,434,829 to Chen, entitled *KNIFE HAVING A WARNING STRUCTURE*, issued on August 20, 2002; and U.S. Patent No. 5,474,452 to Campagnuolo, entitled *TRAINING SIMULATION SYSTEM FOR INDIRECT FIRE WEAPONS SUCH AS MORTARS AND ARTILLERY*, issued on December 12, 1995. Some of these knives provide light when a button is pressed, or when the blade is folded open. No knife is currently available that allows the user to choose to operate the flashlight with the knife unfolded, with the knife folded or for automatic illumination when the knife is unfolded.

SUMMARY OF THE INVENTION

[0004] It is therefore, one object of the present invention is to provide a knife and a process for manufacturing knives equipped with a source of selectively operable illumination.

[0005] It is another object to provide a knife and a process of manufacturing knives with an illumination component that gives the user a choice of operation of the knife with or without illumination.

[0006] It is another object to provide a knife and a process for manufacturing knives with the capability to operate an illumination component momentarily.

[0007] It is still another object to provide a tool and a process for manufacturing tools equipped with a tool port accommodating any of a number of tools within the housing of the tool.

[0008] It is yet another object to provide a tool and a process of manufacturing tools incorporating a mode switch that allows the user to switch between three modes of operation: OFF, ON, and ON-BY-BLADE.

[0009] It is still yet another object to provide a tool and a process of manufacturing tools endowed with an ability to enable a user to locate the knife in the dark, if desired.

[0010] It is a further object to provide a knife and a process of manufacturing knives that enables the knives to incorporate features that can be utilized in all sizes of knives, from small penknives to large buck-skinning knives.

[0011] It is yet a further object to provide a knife and a process of manufacturing knives equipped with a selectively operable source of illumination that can be used with knives that are non-locking, linear-locking, or lock-back locking.

[0012] It is still a further object to selectively provide illumination for use of a tool carried in the tool port of this invention when operated or when used in the dark.

[0013] It is still yet a further object to provide an armed forces training tool and process for manufacturing the tool by providing an illumination signal that could be utilized as a kill score during commando training.

[0014] It is also an object to selectively provide illumination for critical procedures as desired by utilizing the on feature for emergencies such as medical operations.

[0015] It is also an object to provide a folding knife light tool and process of manufacturing a tool with an ergonometric handle in which a source of illumination such as an LED or light bulb or a laser light is incorporated into the handle housing in the spaces existing between the blade, the locking mechanism, and the handle.

[0016] In accordance with the principles of the present invention, a knife's handle may be configured with a body contoured for the hand. The housing is made from one molded piece with a slit in the middle. The handle includes a pivot point for supporting a blade between the longitudinal sides or scales of the blades. A conventional locking, or alternatively, a non-locking system may be used to keep the knife open once the blade has been unfolded from the handle. When the blade of the knife is folded into the handle, a portion of the blade can extend above the sides of the handle for digital engagement in the opening operation.

[0017] A source of illumination or light is attached to the folding knife housing which includes

the handle. In one embodiment, the source of illumination such as one or more lights may be fitted into each side of the opened knife to illuminate both sides of the blade and the area near the tip of the blade. In another embodiment, a source of illumination may be provided only on one side of the blade when the blade is opened. An exposed convex magnifying lens may also be mounted flush with the housing of the folding knife.

[0018] A reflector may be positioned behind the lens and the source of light for maximum, concentration of light output.

[0019] A three position waterproof slide switch may be provided as a mode switch and may be located at the back of the handle of the folding knife in order to provide three modes of operation; OFF, ON, and On-by-blade. A momentary on switch in a microswitch configuration may be provided and placed near the heel of the blade so that when the blade is in an opened position, the light is activated, or toggled on. Additionally, the momentary on switch can be switched to an on position by manual manipulation with either the thumb or finger of the user when the blade is in a closed position and the mode switch is in the ON-by-blade position. Such a momentary switch may be used to momentarily turn off the source of illumination when the blade is in the opened position by using a momentary switch configured with another position for electrically coupling a battery to the source of illumination. Also, a dimming position may be added to the momentary switch in another embodiment. A further feature of switching to another color of illumination can be provided by using different sources of illumination, whether LED's or filtered sources of

illumination, emitting different wavelengths. This feature may be activated by utilizing a version of a momentary switch which incorporates additional switching positions.

[0020] A waterproof battery compartment may be provided to house miniature batteries within the housing, or within the handle of the knife. Any battery or voltage configuration can be used. Also, any portable power source that can be accommodated by the handle can be used. One embodiment may use the newly available AAAA size battery. The power source or batteries may be removable or alternatively, rechargeable, or a solar powered series of cells, or a solar charged battery. The battery compartment could also be fitted with a screw-on waterproof cap type of cover.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] A more complete appreciation of the invention, and many of the attendant advantages thereof, will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings, in which like reference numerals indicate the same or similar components, and wherein:

[0022] Fig. 1 is a view of the folding knife light tool in a closed position.

[0023] Figs. 2, 2A and 2B are views of the knife blade switch parts of one embodiment.

[0024] Figs. 3 and 3A are views of the knife blade switch parts showing the second embodiment of the invention.

[0025] Fig. 4 is a schematic electrical diagram of the folding knife light switches.

[0026] Figs. 5, 5A and 5B are views of the folding knife light tool in the open position and closed position.

[0027] Fig. 6 is a view of the folding knife light tool showing a push button switch that can be switched on by a user or by the knife blade in the open position.

[0028] Fig. 7 is a view of the knife blade accommodating an operating magnet and a magnetic reed switch as the first electrical or toggle on switch.

[0029] Fig. 8 is a view of a block diagram of the folding knife light tool in an embodiment for Armed Forces use (Military Model) which includes an on-by-blade sonic alarm and a laser light package for use with the Army's MILES training system.

DETAILED DESCRIPTION OF THE INVENTION

[0030] With reference to **FIG.1**, the folding knife flashlight tool is shown in one embodiment in a folded position. The illuminating component **100**, housing component **200**, and the blade-switch component **300** comprise the three major components of this embodiment. A illiminator **104** is located behind a lens **102** and in front of a reflector.**103** at the pivot axis **204** end of the housing **200**. The housing **200** has an ergonometric shape for comfort in usage. The lens **102** can be of a focusing type which is adjustable by any of the adjusting means available in the trade. In another embodiment illustrated by **FIG. 5A**, a lens **102** is provided on both sides of the extended blade **302** wherein both sides of the blade **302** are illuminated

[0031] Referring to **FIGs. 1** and **4**, a three position waterproof mode switch **301** is positioned at the end of the housing **200** opposite of the light end. Three modes of operation are provided: OFF, ON, and ON-by-blade. In an embodiment of this invention illustrated by FIG. 6, a momentary-on switch **304** is provided and positioned at the pivot axis end of the housing **200** and near a heel of the knife blade **303** so that when the blade **302** is opened the heel portion **303** of the knife blade **302** contacts and acts as a mechanical lever, with heel portion **303** camming, and thus operationally moving the contact wiper of switch **304**, and thereby switches the momentary on switch **304** into its electrical ON position, thus electrically coupling a source of electrical power such as drycell penlight battery **105** across the filiment of light bulb **104**. This switch **304** will also allow illumination to be used for SOS or other types of distress situations.

Referring to **FIGs. 2, 2A, 2B, 3**, and **3A** another embodiment utilizes a contact washer **306** and a pressure contact **309** on said washer **306** to establish electrical contact to the mode switch **301** and thereby switch the illumination component **100** when conductive plate **312** contacts contact stud contact **313** on the housing **200**. Also another embodiment allows a semicircular contact washer **311** to establish contact with the mode switch **301** and switch on the illuminating component **100**, when the blade **302** is opened and semicircular contact washer **311** contacts the two contact studs **308** accommodated into the housing **200** thereby making a circuit and sending power to switch **301**. Another switch embodiment involves a switch magnet **110** and a magnetic reed switch **108**, referring to **FIG. 7**, wherein switching of the switch magnet **110** by the heel **303** of the blade **302** as the blade is unfolded to the open position places the switch magnet close to the

magnetic reed switch **108** which is then switched on thereby turning on the illuminating component **100**.

[0032] Referring to **FIGS. 5**, **5B**, and **FIG. 1** a waterproof battery **105** compartment **107** is provided. Any of several high density batteries available in the commercial market can be used including lithium, alkaline, and the new miniature fuel cells. AAAA batteries newly available are easily packaged within the confines of the housing **200** together with the spring locking mechanisms, a tool port, and an accessory tool **206** accommodated in the tool port **205**.

[0033] In another embodiment of the invention, the momentary on switch **304** and the mode switch **301** are collocated at the battery compartment **107** end of the housing. This collocated switch **116** combines the functions of both of these switches. The momentary on switch is switched on however by the forward part of the knife blade **302** as the knife blade **302** closes and presses against a cam type actuator **120** , or in another embodiment, comes in between a switching magnet and a magnetic reed switch thereby cooperating with said magnet and magnetic reed switch to switch off said magnetic reed switch. In this embodiment a magnetic steel including magnetic stainless steels would be used for the blade **302.** This actuator **120** can also be switched on by a thumb switch **114**, whether the blade is folded open or closed.

[0034] In a military embodiment of the invention **FIG.8** several packages are added and the housing **200** is modified to accommodate the features added. A sonic alarm package **214** that

cooperates with the US Army's MILEs training is switched on at the same time as the illumination component **100**. The Sonic package **214** is powered by one or more dry cell batteries installed within battery compartment **107**. A laser package **112** and an RF package **118** that are also MILEs compatible can also be incorporated. Theses added packages; sonic **214**, laser **112**, and RF **118** are all powered by the batteries in the battery compartment **107**. US Patent No. 5,474,452 issued to Campagnuolo and assigned to the US Government, as represented by the Secretary of the Army, is incorporated herein for information about the MILEs system. Basically the laser, sonic, and RF packages when received by devices carried on a harness worn by a soldier during training register as "hits" and/or "kills" and assist in scoring the capabilities of units in training. Another version of the militry model would be an actual offensive type weapon carried by special forces and would include a quick-release mechanism for the blade **302**. A quick-release button **210** on this commando model would allow one handed operation of the invention for combat purposes. In the weapon model, the quick-release button must be depressed to unlock the blade **302** so to fold the blade **302** back into the housing **200**. Additionally the MILEs packages **112**, **214**, and **118** are not necessary except for training, and need not be included in the commando model. In a further development, a medical model is embodied in a design comprising a quick release mechanism and an illumination feature for used by surgeons who need to open knives with one hand during combat medical procedures.

[0035] A unique feature of the invention is the three way mode switch installed during manufacture of the tool by incorporating the mode switch to allow the user to manually switch

between three modes of operation: and electrically OFF state where no electrical energy from the batteries is supplied to the source of illumination, an electrical ON state where the electrical energy from the batteries is applied to the source of illumination (*e.g.*, across the filament of a light bulb or across the semiconductor junction of a light emitting diode) , and an electrical ON-BY-BLADE state where the state of the mode switch enables the movement of the blade, or other tool, from storage within the handle of the housing to a deployed and functionally operable position, for example, with the blade of a knife extending distally outwardly from the handle, or the tip of a screwdriver extending distally outwardly from the handle to engage the heads of threaded fasteners. The mode switch provides the capability to turn the light on without the knife being opened. The mode switch also provides the feature of being able to open the knife without any light coming on. By leaving the knife mode switch in the on-by-blade position, the light goes on and off by opening and closing the blade without ever having to touch a switch.

[0036] A tool port is provided for attaching an accessory tool or tools to the knife housing. The tools attached can be one or two of a variety available in multiuse tool knifes today, for example: tweezers, scissors, razors, scalpels, picks, forks, spoons, and especially a standard hexagon driver tool. A variety of other common and uncommon tools can be utilized depending upon the specific need.

[0037] In one embodiment of the invention, the actual heel of the blade is provisioned with a contact washer that cooperates with a contact stud in the handle housing to complete an electrical

circuit when the blade is in an open position, a contact plate fixed to the blade makes contact with another contact stud in the handle and thereby turns on the light or illumination by its' switch action. In a related embodiment the heel of the blade is provisioned with a semi-circular conductive washer around the pivot point whereby when the blade is in an open position, two barbed contact studs attached to the housing handle contact the conductive semicircle and complete an electrical circuit to switch on the light, when the blade is in a closed or folded position, the two barbed contact studs rest on a non-conductive washer located under the semi-circular conductive washer. The blade itself can be the conductive switch part which turns the light on when the blade is opened. This switching could be accomplished by incorporating all of the features on a wiring board or printed circuit board or other available electronic packaging means.

[0038] In a further embodiment of the invention the momentary on switch and the three way mode switch, are provided as one switch assembly at the battery supply end of the knife housing wherein the switch assembly performs the same function as the two separate switches. The momentary on switch is switched however by the forward end of the blade as it comes to a closed position and switches off the momentary on switch. Both the two switch embodiment and the combined switch embodiment contain a momentary on button for the thumb or finger of the user to be able to switch ON the light when the blade is in a closed position...The thumb switch buttons are able to switch on the light or switch off the light, in the ON-by-blade position of the three way position switch. In addition, the thumb switch buttons can dim and or switch in another color of

illumination by switching to different LED's for example. Dimming would be accomplished by switching in a resistor or other passive or active electronic component standard in the industry.

[0039] In another embodiment of the folding knife light tool called the military model, a sonic package to cooperate with a MILE's training system is incorporated. The sonic package emits an acoustic signature compatible with the MILE's system to indicate a hit or a "kill" on the MILE's device worn by a soldier in training. In addition an RF package can be added to communicate with another version of the MILE's system. Also a laser light package can be installed on the folding knife to register a hit or kill on the wearer of a MILE's harness. The sonic, RF, and Laser packages are all controlled by the toggle switch of the folding knife. The housing of the military model is more elongate and of a larger diameter to handle the extra functions, all of which do not need to be present at the same time, that is, some models may only have the sonic package, etc. A training version of the military model can be provisioned without a blade or with a rubber blade for training purposes, especially with a quick release opening mechanism. The military model can also be used as a commando knife with all of the features of the folding knife and with one embodiment having the switchblade mechanism and a switchblade pushbutton to suddenly release the blade to an open position thereby startling an enemy. The elongated handle in this embodiment has a hammer feature at the blade end that can be useful in hand to hand combat, especially with the knife blade extended. This model would only be available as an issued weapon to combatants or to trainees as a training version. Reference is made to U.S. Patent No. 5,474,452 issued to Campagnuolo and assigned to the US Government, as represented by the Secretary of the Army,

for information about the MILE's system. In the weapon model, the pushbutton switch must be pushed to release the knife blade which is locked open so that the blade can be folded back into the handle. This action also turns off the laser light, sonic alarm system, a first illumination component, and the laser and a radio frequency (*i.e.*, RF) packages if installed. Turning the three way mode switch to the OFF position also opens, that is, turns off the application of electrical power to all systems.

[0040] Although preferred embodiments of the present invention have been described, it will be understood by those skilled in the art that the present invention should not be limited to the described preferred embodiments. Rather, various changes and modifications can be made within the spirit and scope of the present invention, as defined by the following claims.